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TUBE ROLLING MILL

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Fig. 5.

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This invention relates to tube rolling mills, the objects being to generally improve their construction and specifically including, among other things, the provision of an efficient roll pressure applying means, an easy way to change the guides holding the work in the roll pass and an improved form of these guides.

The accompanying drawings illustrate one specific form of a mill constructed in accordance with this invention, of which—

Figure 1 is a top plan.

Figure 2 is an elevation of the receiving end.

Figure 3 is a vertical cross-section from the line III—III in Figure 2.

Figure 4 is a horizontal cross-section from the line IV—IV in Figure 3, and

Figure 5 is a vertical cross-section from the line V—V in Figure 4.

The above show a frame 1 mounting rolling rolls 2. These rolls are the type which draw the tube being shaped longitudinally by having their axes at an angle to each other, and must be mounted so that they may be adjustably oppositely inclined. Accordingly, they are mounted in cylindrical cradles 3 which rotate in boxes formed in the frame 1, their adjustment being secured by means of opposed offset cranks 4 rotated by a common shaft 5 and connected to each cradle by links 6. The shaft 5 is driven through a worm by a reversing motor 7.

Pressure adjustment of the rolls 2 is obtained as follows. Each roll is constructed with front and rear spindles 8 which are carried in water-cooled journals 9 having mounting ends 10 sliding in guideways 11 in the cradles 3. These ends are in screw-threaded engagement with shafts 11a which are fixed against longitudinal movement in the rear parts of the cradles 3 beyond the guideways 11. These shafts are fixed solidly against the thrust of the rolls, roller bearings 12 being preferably used for this purpose. The shafts 11a carry gears 13 which are meshed with pinions 14 carried by stub shafts 15. These stub shafts are journaled in the ends of the cradles 3 so that the axes of each are alined, whereby rotative movement of the latter does not affect their positions. This feature is important because it enables the use of stationarily mounted reversing motors 16 to adjust the roll pressures.

The work is prevented from leaving the pass of the rolls 2 by top and bottom guide-rollers 17. The use of guide-rollers instead of sliding shoes is believed to be new and is one of the factors in the successful rolling of large diameter thin walled tubes. The rollers run on shafts 18 whose ends are in journal blocks 19. The journal blocks carrying the bottom roller rest in chairs 20 cast in a frame 21 which slides vertically in the mill frame. Adjustment of this vertical movement is secured by wedges 22 on which this frame rests and which are moved by a common shaft 23 having a screw-threaded end engaged by a gear nut 24 which meshes with a gear 25. This latter gear may be turned manually if the weight of the lifted parts is not excessive or a suitable reversing motor may be used.

The journal blocks 19 carrying the upper guide-rollers 17 are held in chairs 26 cast in a part of the cap 27 of the mill. The upper block is secured by a keyed pin 28 and the lower one by a 15 shoe 29. The upper block of the lower roll is held by a similar shoe 30 and both of these shoes are fixed in place by integral lugs 31 which dovetail into the cap 27 and frame 21 respectively. These shoes 29 and 30 also serve to guide the tube 20 being shaped just as it reaches the rollers. The lugs 31 are held against disengagement by fingers 32 which are pressed thereagainst by rods 33 tensioned by screw-threaded elements 34. These fingers and their holding elements differ in construction somewhat only because of the exigencies of their respective locations.

The cap 21 is novel in that it is constructed in three pieces which are held to the frame 1 by keyed pins 35. The inner ends of the outer segments rest directly on the frame, which is provided with upstanding central extensions 36 for this purpose, and the center segment rests on these so that the same pins may be used to hold both at these points. It is the center segment of this cap which carries the guide roll 17, this being considered an important feature because it eliminates the present need for lifting the entire cap when it is necessary to remove or repair the top guiding element (in this case the roll 17). Removal of the cap when it is in one piece is an arduous procedure because its extremely heavy weight and awkward shape cause it to swing and this makes it hard for the workmen to aline it with its holding pins.

This center cap segment 27 includes vertically sliding and fixed parts. The fixed portion is secured by keyed pins 35 in the manner already mentioned and carries vertical shafts 38 which have shoulders 37 on which the sliding portion rests. This sliding portion carries the top one of the guide rollers 17 solidly and must therefore be provided of vertical adjustment. This is secured by these shafts 38 which have screw-threaded ends en-
gaged by gear nuts 38 driven by worms 39 mounted on a common shaft 40 and geared to a reversing motor 41.

It is to be understood that a modern mill is generally of the open-topped frame type, yet requires a construction permitting the application of extremely heavy roll pressures. This was not the case with the older mills and these were therefore seldom designed and constructed for the purpose of preventing the roll pressures from spreading the frames. However, since the mill being described is a modern one, the cap 27 is intended to function as a brace for the entire open-topped mill frame 1. For this reason, the various segments are provided with finger portions 27a which engage the frame and each other, and are of sufficient size to carry the tensions created by the heavy roll pressures. Safety is further assured by the fact that the center segment is mounted by the same pins that mount the outer ones, these pins thus transmitting the tension from one segment to another.

The rolls 2 are driven by individual motors 42 through shafts 43 and universal couplings 44, gear boxes 45 providing for the necessary speed reduction. This arrangement enables the angularity of the rolls to be adjusted much more easily than when they are interconnected by a common driving shaft. In order to prevent all these motors must, of course, be run in absolute synchronism.

After the angle of the rolls has once been correctly set, the cradles 3 are locked against further turning by brakeshoes 48 which are forced against them. These shoes are in screw-threaded engagement with shafts 47 which may be manually turned by pinned wheels 48.

It should be noted that the rollers 17 perform no work on the tube since they are not sufficiently closely spaced for this purpose. They function as guides which contact the tube at its widest portion so as to hold it between the working rolls.

Although a specific form of this mill has been shown and described in accordance with the patent statutes, it is not intended to limit the scope of the invention exactly thereto, except as defined by the following claims.

I claim:
1. A tube rolling mill including the combination of an open-topped frame, axial working rolls 18 journaled by said frame, a cap for closing the top of said frame and including a central removable segment, a roller for holding tubes against rising from the working pass of said rolls, journals for said roller, said segment having a depending portion providing chairs above said pass for said journals, and means for holding said journals from dropping from said chairs.
2. A tube rolling mill including the combination of an open-topped frame, axial working rolls 25 journaled by said frame, a cap for closing the top of said frame and including a central removable segment, a roller for holding tubes against rising from the working pass of said rolls, journals for said roller, said segment having a depending portion providing chairs above said pass for said journals, and means for holding said journals from dropping from said chairs, said means providing a friction surface constructed to guide tubes toward said roller.

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